

## CLAIMS

### What is claimed is:

1. In a gas supply apparatus for a polymer electrolyte fuel cell system  
5 comprising: an inlet pipe through which the reactant gases is supplied from a reactant gas reservoir; a reactant gas flux regulator for adjusting the flow rate of supplied reactant gases; a reactant gas supplying pipe for supplying the humidified reactant gases to the fuel cell; a pressure regulator for adjusting the pressure of reactant gases inside the fuel cell; a coolant  
10 regulator for cooling the fuel cell; a fuel cell temperature regulator for adjusting the temperature of the fuel cell; and a humidifier for humidifying the reactant gases for a polymer electrolyte fuel cell system, said humidifier comprising:  
a humidification vessel to which a reactant gas inlet pipe for  
15 supplying reactant gas thereto, a water inlet pipe for supplying water thereto, and a reactant gas supplying pipe for supplying the humidified reactant gases to the fuel cell are connected, respectively; and  
a spray which is installed in the humidification vessel and finely  
sprays the reactant gases and water supplied to the humidification vessel.  
20
2. The humidifier according to claim 1, wherein said humidification vessel is provided with a double passage, where a coolant heated by the fuel cell flows, in order to preheat the reactant gases introduced into the reactant gas inlet pipe.  
25
3. The humidifier according to claim 1, wherein said humidification vessel

is provided with a double passage, where hot coolant heated by the fuel cell flows, in order to preheat the water introduced into the water inlet pipe.

4. The humidifier according to claim 1, further comprising a water storage tank for storing the water supplied to the spray.

5. The humidifier according to claim 4, wherein said water storage tank is equipped with a valve capable of replenishing the tank with water without ceasing operation of the fuel cell.

6. The humidifier according to claim 4, wherein said water storage tank is further equipped with a water flux regulator for adjusting the amount of water supplied to the spray so that it can vary the amount of humidification.

7. The humidifier according to claim 1, wherein said humidification vessel is further provided with a double passage, where hot coolant heated by the fuel cell flows, in order to heat the humidified reactant gases just after it is sprayed.

8. The humidifier according to claim 1, wherein said reactant gas supplying pipe is a dual pipe that is designed to allow the coolant heated by the fuel cell to flow through the exterior passage thereof in order to maintain the temperature and pressure of the humidified reactant gases to be uniform.